# Literature Review for Knowledge Exchange and Enterprise Network (KEEN) Research

## A report of the literature review for research into knowledge exchange processes in KEEN projects funded by the European Regional Development Fund and managed by the University of Wolverhampton.

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## 1.1 Introduction

This review presents data relevant to funded business support interventions in terms of West Midlands business activity and reviews the literature relevant to the transfer of knowledge between and within organisations, as aspects which underpinned and informed the direction of the project. It contains an evaluation (see Appendices 1 & 2) of appropriately selected models of the process of knowledge transfer relevant to this research into the interventions of Knowledge Exchange and Enterprise Network (KEEN) projects, undertaken with Small and Medium sized Enterprises (SMEs) in the West Midlands.

The European Regional Development Fund (ERDF) has supported bespoke knowledge transfer alliances between SMEs and a consortium of twelve universities in the West Midlands region, in order to improve competitiveness and foster innovation. Hitherto, the major focus in evaluating the impact of such collaboration has primarily been centred upon the financial benefits of new knowledge, rather than the process by which it is transferred. It is considered that the mode of transfer might be a factor in the outcomes of an intervention.

## 1.2 Designing the research framework: The search for an appropriate model

The literature review was undertaken to assess the current state of knowledge surrounding UK business support initiatives related to the West Midlands, and knowledge transfer programmes in particular. A second, but no less important, objective was to identify models of knowledge transfer which might help in devising a research framework, since holistic (from beginning to end) studies of the process are not commonly undertaken.

The existing literature does not offer a comprehensive SME study which includes the knowledge transfer processes employed in the development of tangible outcomes. An examination of existing knowledge transfer models identified a short list of frameworks which might be used to inform the study. The models which were evaluated encompassed issues and elements appropriate to the analysis of external interventions in the SME context, and which were particularly relevant to the KEEN collaborations. The models evaluation exercise resulted in the generation of a protocol which informed both the research direction and data analysis within the study of the knowledge transfer process, and the impact of KEEN on its beneficiaries.

The final shortlist of models was comprised of the following list:

- Davey et al. (2011): University/Business collaboration model
- Graham et al. (2006): Knowledge-to-Action process model
- Lyons (2009): Model of factors in the knowledge transfer process
- Nonaka and Takeuchi (1995): Model of the communication perspective of knowledge transfer
- Rossi et al. (2014): Model to measure transfer collaboration
- Sherwood et al. (2004): Model of knowledge creation and use
- Szulanski (2000): Model of the process of knowledge transfer
- Ternouth et al. (2012): Process model of knowledge transfer in open innovation
- Zahra and George (2002): Absorptive Capacity model.

The short listed models are summarised in Appendix 1 and reviews can be found in Appendix2.

Whilst the work of all these authors contributed to the design of the research framework, one of the most informative and useful models for our purpose was that of Gabriel Szulanski (2000). This emanated from a longitudinal quantitative study of multinational companies in the USA and identified a number of variables present in the knowledge transfer process which lend themselves to the small firm scenario; these insights helped to inform perspectives and the design of the research project.

## 1.3 The Background to the Study – Economics and Funded Interventions

The West Midlands has a high proportion of small firms (see Appendix 3) which need the knowledge and skills required for innovation and growth, being required platforms for increased competitiveness and the reduction of both national and regional unemployment. Government and EU funded initiatives are

available to enable firms to take advantage of collaboration with universities to improve their competencies. Two of these, KEEN and Knowledge Transfer Partnerships (KTP), are described below.

## 1.4 Knowledge Exchange and Enterprise Network (KEEN)

KEEN is a three way collaboration between a university, a business and a graduate (known as an affiliate). It is a project which provides assistance to the company at the pre-innovation stage. Its prime focus is assisting with the transformation and growth of small businesses that are unable to do so because of inadequate resources/ proficiencies, or a lack of fundamental facilities, systems, or in-house processes.

Such companies have a requirement for relatively simple transformative knowledge using a targeted and direct approach. These companies are receptive to new knowledge and tend to have the potential absorptive capacity to assimilate and use knowledge contributing to the enhancement of competitive advantage (Zahra and George, 2002; Ternouth et al., 2012).

KEEN supports SMEs with expertise, advice and business support in the areas of:

- new product or service development
- business process reengineering
- performance improvements
- technology
- technical or premises-related problem solving
- strategic marketing interventions

(Business Support Guide, 2014: p.23).

## 1.5 Knowledge Transfer Partnerships (KTP)

Knowledge transfer partnership (KTP) is a UK nationwide government intervention programme designed to assist UK enterprises to enhance their competitive advantage and productivity via the effective use of the knowledge, technology, and expertise existing within UK universities (KTP Online, 2014). KTP offers a strategic approach and innovative solutions. Intervention via the programme is reported to result in a growth in profits as a result of collaboration, through increased quality, improved operations management, higher sales, and better access to new markets (KTP Online, 2014).
The three key players in a KTP are:

- **The business partner**, usually a UK registered company inclusive of not-for-profit organizations
- **The university,** generally referred to as the “knowledge-base partner”
- The **KTP associate**, a recent university graduate, who is a knowledge transfer agent.

This view is supported by Salter and Martin (2001), who argue that the objective of the three way collaboration between universities, businesses, and associates is to boost innovation, transfer knowledge, and drive economic growth and welfare.

## 1.6 Similarities and Differences between KEEN and KTP

While both KEEN and KTP are similar in that each involves a 3-way partnership between the university, business, and graduate, they differ in a number of ways. According to Rosli and Robinson (2014), under KTP, the university employs the graduate; however, the company is the employer for a KEEN associate/graduate. KEEN is funded by ERDF while KTPs are funded by the UK government via Innovate UK, formerly known as the Technology Strategy Board.

KTP supports businesses of any size (KTP Online, 2014), whilst KEEN supports businesses that fit within the official definition of SMEs (Small Medium Enterprises) as defined by the Federation of Small Businesses (Business Support Guide, 2014; Federation of Small Business, 2013).

## 1.7 SMEs and Knowledge Transfer

SMEs are a very important feature of the UK economy. According to government statistics, in 2014, there were 5.2 million businesses classified as an SME (i.e. those with fewer than 250 employees) in the UK, which was 99.9% of the total for all businesses (White, 2014). Indeed, in 2013, 4.7 million of the businesses in the UK were classified as a micro business (with 0-9 members of staff) (Rhodes, 2014). SMEs also accounted for 59.6% of private sector employment, with 14.4 million people employed by SMEs in 2013 (Federation of Small Businesses, 2013).

In 2011, 74% of SMEs stated that they had worked with a university during the previous year (Universities UK, 2011). Three main areas of engagement identified in the survey by Universities UK: were professional development, research, and working with current and recent students. The survey identified that 12% of SMEs had participated in collaborative research with a university, 9% had contracted a university to undertake specific research, and 7% of SMEs had made use of equipment or facilities. Additionally, 27% had employed recent graduates, whilst 18% had offered placement schemes, 14% internships, and 10% had also offered places on 'live' business projects. More detail of the interventions available can be found in Appendix 4.

## 1.8 SMEs and Universities

In 2011-2012, just over 90% of universities in the UK reported that they had enquiry points for SMEs (Universities UK, 2013). These enquiry points are direct points of contact where SMEs can enquire about the programmes of support which a university can offer them. This reflects a significant shift in the attitudes held by universities in the last ten years. Enquiry points are located in specific schools or faculties, or in some instances separate departments. These developments reflect a greater professionalism in the way that business and universities cooperate. Before these formal structures were established, the relationship between business and universities was very informal. Previously, the relationship would often be managed by an academic through their personal connections and networks. In addition, Universities UK Research also noted that 48% of universities had made cultural changes to become more business focused over the 2001 to 2011 period.

## 1.9 Why do SMEs engage with universities?

Two areas of benefit for the company from engaging with a university were identified by Arza (2010). Broadly, these are production and innovation. In the former case, a typical benefit might be the problem solving of immediate issues, e.g. testing and quality control. In the latter instance, the benefit is long-term and comes from tapping into university resources for novel technologies. However, this support is available only during the life of the project, unless continuing arrangements are made (Rossi et al., 2014).

Benefits which may accrue through innovation and access to highly skilled research teams include: the identification of new R&D projects, the selection of firms to be included in research projects, technology licences, patents, and access to university research and discoveries (Rossi et al., 2014). The ultimate benefit of these factors is that the successful utilisation of knowledge and assets will lead to the development of new products or processes and ultimately to an increase in competitive advantage as a platform for growth. Whilst patents may not be relevant to all SMEs (due to issues of cost), assistance for product or process development is important, and universities are clearly a key factor in this process within the established KEEN projects.

# 2.1 The Knowledge Literature

Knowledge transfer in this context is a series of actions by which the knowledge, expertise, and intellectually connected assets of universities are effectively adapted for practical use beyond higher education for the general benefit of the economy and society at large (Holi et al., 2008). SMEs and large companies have been partnering with universities to carry out shared research and development (R&D) and innovation activities which could have otherwise been hindered by financial constraints (D'Este and Lammarino, 2010; Lee, 1996). Universities located in countries with higher levels of R&D and gross domestic product (GDP) were suggested to be more efficient and possess advanced knowledge transfer capabilities (Chapple et al. 2005).

## 2.2 Views on Knowledge, Knowledge Transfer and Knowledge Management

Knowledge can be examined from many angles. It can be seen as “a state of mind; as an object; a process; a condition of having access to information; or a capability” (Alavi and Leidner, 2001). The viewpoint of knowledge as a state of mind is centred on empowering individuals to grow their personal knowledge and apply it to the company’s needs. Alternatively, the perspective of “knowledge as an object” suggests that knowledge can be looked at as a “thing” to be gathered and manipulated. However, the process perspective of knowledge is centred on the application of knowledge, expertise, and know-how. The fourth viewpoint of knowledge as a condition of access to information is composed of the notion that a firm’s knowledge must be organised to facilitate access to, and retrieval of, content. This perspective may be considered an extension of the notion of knowledge as an object, with the key emphasis on ease of access to the knowledge objects. Finally, knowledge can be regarded as a capacity with the potential for influencing future action (Alavi and Leidner, 2001) and the ability to utilise the knowledge (Watson, 1999). The concept of knowledge management is defined by Voronchu and Starineca (2014) as “the process of making decisions connected to the activities for leveraging knowledge of people in the organisation to improve their performance.”

Knowledge transfer is a field of knowledge management involved with the transition of knowledge across the perimeters created by specialised knowledge domains. It is the movement of knowledge from one location, individual, or owner to another. Successful knowledge transfer leads to the receiving entity acquiring and comprehending new knowledge (Carlile and Rebentisch, 2003). Knowledge sharing is a "people-to-people process" (Ryu et al., 2003) where there is mutual exchange of information (Truch et al., 2002). Hence it is a bi-directional process through which new information and knowledge passes between the collaborators. Knowledge transfer occurs through the process of active communication of knowledge to others, or through seeking knowledge and advice from others to learn what they know (Liyanage et al., 2009). Organisations and their staff may adopt knowledge transfer techniques to acquire or transmit important information necessary for the business. They may also engage in constant innovative improvement to the knowledge acquired. (The intellectual property rights (IPR) of the original knowledge owner are of paramount importance here and a clear understanding of the legal position is important to avoid infringements of IPR, and potential lawsuits).

Both knowledge management and knowledge transfer are a means of creating a culture of information sharing, requiring partnerships, collaboration, and an exchange of information to enable a firm to operate more efficiently, to maximise resource use and engage with innovation (Liyanage et al., 2009). According to Argote et al. (2000), firms capable of effective knowledge transfer and information sharing from one department to another are more effective and have more chance of survival and business longevity than those averse to knowledge sharing. Knowledge transfer happens by various means such as staff transfers or relocation, training, communication, observation, technology transfer, product reengineering, copying processes or techniques, through registered patents, published scientific papers, and other forms of collaboration.

## 2.3 Knowledge Brokers

Knowledge brokers (KBs) are the thread that connects researchers, business executives, policy decision makers, and professionals, aiding collaboration for enhanced mutual understanding of the goals and objectives of each party, which necessitates an understanding of how each party's business culture impacts upon each other's work. Knowledge brokers assist in the creation of fresh partnerships by utilising research based evidential knowledge (Gagnon, 2011; Straus et al., 2011; Urquhart et al., 2011 Lomas 2007; Lyons et al., 2006).

Knowledge brokers strengthen information exchange and provide access to relevant, up-to-date information. An important attribute of a knowledge broker is the capability to seek and harness appropriate current evidence to create new solutions by collating and exchanging knowledge (Hargadon, 2002; Zook, 2004). An important attribute of the individual(s) is to have relationship management skills and metacognition of their role as a broker, as well as the recognition that a wide range of strategies will be needed to affect knowledge transfer through the act of brokerage.

The work of Ward et al. (2010) in investigating a number of studies in the health sector, in particular in the UK, Canada, and Australia, has highlighted the importance of knowledge brokers in the knowledge transfer process and they confirm that they are active within the social groupings in which they operate. Their work involves facilitating social interaction and collaborative processes, which often focus on activities intended to find, assess, interpret, and adapt the evidence people are seeking, and to identify emerging issues that could be resolved by the use of research knowledge. Ward et al. (2010), using

information drawn from CHSRF (2003), suggest that, "knowledge brokers are individuals who are positioned at the interface between the worlds of researchers and decision makers, making them the human force behind knowledge transfer." In this study, the role of knowledge broker is less explicit, with the task falling to the key actors in the relationship.

## 2.4 Motivation for Knowledge Sharers

According to Wang and Noe (2010), "knowledge is a critical organisational resource that provides a sustainable competitive advantage in a competitive and dynamic economy." The motivation to share knowledge is a critical factor in maintaining a competitive edge.

Motivation is an important determinant of human behaviour. Workplace attitudes of staff have been suggested as the key motivator for knowledge transfer and information sharing among staff (Deci and Ryan, 1987; Moon and Kim, 2001; Osterloh and Frey, 2000). Given the nature of knowledge transfer, motivational triggers are also relevant to both firms and the academics who engage in this type of activity. The benefits for these parties are less clearly defined.

Research findings by Hung et al. (2011) suggest that "reputation and feedback" acts as a strong motivator for both the quality and amount of knowledge shared. A company's absorptive capacity indicates its ability to recognise, utilise, and assimilate new knowledge for commercial means (Volberda et al., 2010; Lewin et al., 2011; Cohen and Levinthal, 1990).

The motivation to share knowledge can be sub-divided into two types: extrinsic and intrinsic. The prime focus of extrinsic motivation is goal-oriented, such as rewards or benefits gained for performance of a task. Intrinsic motivation is the pleasure and inherent satisfaction derived from a specific activity (Hung et al., 2011, Deci, 1975). Both extrinsic and intrinsic motivation influences a person's desires and behaviour about an activity (Hung et al., 2011; Davis et al., 1992; Moon and Kim 2001; Deci 1975).

## 2.5 Motivations for Knowledge Sharing in the Firm

The extrinsic motivation of staff to share knowledge is the result of a belief based on the staff's perceptions of the value linked to information sharing (Osterloh and Frey, 2000; Bandura, 1977; Kankanhalli, Tan and Wei, 2005). For instance, employees participate in knowledge sharing based on a cost-benefit analysis, comparing the rewards (benefits) expected from an exchange with the effort (costs) involved in that exchange. From a socio-economic perspective, if the anticipated benefit equals or exceeds the costs then the sharing process will continue; otherwise, it will stop (Kelly and Thibaut, 1978). In the context of knowledge exchange, the costs include factors relating to effort such as time, mental effort and more, while the potential gains include receiving organizational rewards or creating obligations for colleagues to repay the favour (Davenport and Prusak, 1998; Ko, Kirsch and King, 2005).

Several studies have adopted conceptual or qualitative approaches to understand the motivators underlying knowledge sharing behaviour (Bartol and Srivastava, 2002; Damodaran and Olpher, 2000; McDermott and O'Dell, 2001; Weir and Hutchings, 2005; Yang, 2004). Moreover, studies suggest that extrinsic and intrinsic motivation factors are the antecedents of information exchange behaviours (Osterloh and Frey, 2000; Bock, Zmud and Kim, 2005; Tyler and Blader, 2001).

## 2.6 Motivations for Knowledge Sharing by Universities and Academics

Universities and academics have common motivations for sharing knowledge and it is the academic engagement with the process which ultimately aids fulfilment of the university objectives. For the universities, these are primarily categorised as financial and reputational benefits which are interlinked. Funding is generally specific and acts as a catalyst for other funding sources. Higher funding levels can be attracted by projects which generate enhanced research output. A reputation for engagement with research attracts more and higher funding levels; a reputation for engagement with industry attracts greater interaction with firms through funded schemes, direct consultancy, and the provision of sector-related continuous professional development. It simultaneously raises the attraction of the university to those wishing to study, in turn yielding enhanced fee income.

For academics, engagement with industry, unlike teaching, is a discretionary aspect of their timetable (D'Este and Perkmann, 2010). Therefore, it is important to understand what motivates academics to engage with business. Owen-Smith and Powell (2001) argue that in some areas (such as life sciences), the opportunity to generate patents provides a greater financial motive for academics due to the high value of these patents. However, in other areas (such as the physical sciences), the value of patents is lower; therefore, using knowledge transfer for financial gain is less of an incentive. In these cases, academics are more likely to be motivated by a desire to develop relationships with organisations or further exploit research opportunities (Owen-Smith and Powell, 2001). Therefore, academics from different backgrounds may well hold different motivations.

The study by D'Este and Perkmann (2010) provides four main motivational groups. These are learning motivations, access to resources, access to funding, and commercialisation. Learning motivations concern aspects which are related to learning opportunities with business (i.e. the ability to enable academic research to be informed by industry engagement). Access to resources provided by industry, such as materials, expertise, or equipment, enable the updating of business related knowledge. The third motivation relates to access to funding (from industry as well as public bodies), and the final motivation concerns commercialisation (or personal economic returns) (D'Este and Perkmann, 2010). These motivations are summarised below in Table 1.

**Table 1: Type of Motivations**

| Learning Motivation | Access to Resources | Access to Funding | Commercialisation |
|---|---|---|---|
| • Applicability of Research<br>• Information on Industry Problems<br>• Feedback from Industry<br>• Information on Industry Research<br>• Becoming Part of a Network | Access to:<br>• Materials<br>• Equipment<br>• Research Expertise | Research Income from:<br>• Industry<br>• Government | • Source of Personal Income<br>• IPR |

**(Adapted from D'Este & Perkmann, 2010)**

However, the motivations outlined by D'Este & Perkmann (2010) are not wholly applicable for a KEEN programme. Personal commercialisation may not be as relevant to a KEEN programme since the

academic is assisting an affiliate and a company in a knowledge transfer process, rather than seeking to commercialise the research output for their own benefit.

Davey et al. (2011) outline several benefits of business collaboration to the academic. This includes enhanced reputation, enhanced employability, increased standing within their institution, and being vital for personal research. Clearly these benefits are motivators for academics who wish to progress these aspects of their career in addition to contributing to improved teaching materials, or writing specific research papers on the engagement with business.

## 2.7 The Knowledge Transfer Process

According to Szulanski (2000), knowledge transfer is an incremental process with the ideal outcome being integration; it is probable that some firms, particularly small ones, never manage to reach this stage as they are prevented by a combination of factors. Furthermore, the knowledge transfer between subsidiary firms of the same company are often strenuous, challenging, and tedious, though prior perceptions dealt with them as "costless and instantaneous." The existence or possibility of challenges was often treated as an exception rather than a normal feature of the transfer process. The first step toward including difficulty in the knowledge transfer analysis demands recognition that knowledge transfer is not an act but a process.
The knowledge transfer process proposed by Szulanski (2000) includes four key stages, consisting of initiation, implementation, ramp-up, and integration, and recognises the potential for difficulty referred to as "stickiness" in the knowledge transfer process.

The process of knowledge transfer is not only a transfer of information; it requires an additional type of knowledge and the knowledge about how to transfer knowledge. Rather than simply saying 'this is what I know,' the knowledge transfer process goes a step further to say 'this is what new knowledge means for you.' The objective of knowledge transfer may be lost if knowledge is transferred from the originator to the recipients without contextualising the way it will be utilised by the latter. This process can be identified as knowledge transformation (Seaton, 2002). Transformation denotes an organisation's ability to develop and refine the routines that facilitate the combination of existing knowledge and the newly acquired and assimilated knowledge (Zahra and George, 2002).

## 2.8 Issues in the Knowledge Transfer Process

The knowledge transfer process model is non-linear. This implies that as aspects such as the culture of the firm, resources, systems, and processes change, so will the roles of the knowledge source and recipient (Lyons, 2009). This is in agreement with Szulanski (2000) who states that the knowledge transfer process is dynamic. This implies that change management is an integral component of knowledge transfer since both the change itself, and the ability to assimilate it and understand how it is received by direct and/or indirect participants, will influence the process by providing enablers or barriers to achieve timely outcomes.

## 2.9 Barriers in Knowledge Transfer Interventions

Barriers to knowledge transfer were highlighted in the Lambert Review (Lambert, 2003) and have been studied extensively since then by Cope et al. (2009) and CIHE (2009). Businesses perceive tangible barriers which highlight their existence within the knowledge transfer for innovation.
A recent study by Innova (2011) of barriers to innovation in SMEs collated evidence from published literature and tested this against stakeholder views through an online survey to businesses across Europe. The result indicated the top five barriers that organisations identified as hindering innovative capacity were:

- Limited financial resources and access to finance
- Shortage of expertise in innovation management
- Insufficient use of public procurement to encourage innovation in SMEs
- Limited expertise to manage intellectual property
- Weaknesses in networking and co-operation with external parties.

The main obstacles were classified into two groups termed “orientation related barriers” and “transaction related barriers.” Orientation barriers included: the inclination of universities for science-related research, the long-term nature of knowledge-based research, and a bilateral lack of understanding of expectations and approach to work. Transactional barriers included unrealistic expectations, disagreements on confidentiality and IPR, and funding controls by awarding bodies (Innova 2011).
In agreement with Lyons (2009) and Szulanski (2000), Sheng et al. (2013) suggested two knowledge transfer obstacles as “knowledge stickiness and knowledge ambiguity,” which may adversely impact knowledge transfers. However, Sheng et al. (2013) proposed the use of information communication technology (ICT) capabilities as a moderating factor to overcome or minimise knowledge transfer obstacles. Moreover, Schulze et al. (2014) stated that the dimension of spreading new knowledge involved two capacity factors. The recipient requires the capacity to receive the knowledge, but also the source must have the capacity to spread the knowledge. This is complementary to the view supported by Zahra and George (2002).
Furthermore, the result of a study by Dyer and Hatch (2006) examining the impact of knowledge sharing in business networks suggested that companies which engaged in more information sharing with suppliers in the auto-trade manufacturing industry have a lower product defect rate, in comparison to their counterparts who refrain from information sharing. Hence, knowledge transfer not only results in increased competitive advantage, but also leads to improved business efficiencies which can be of benefit to SMEs. However, barriers such as network constraints and the rigidity of internal processes can potentially limit knowledge transfer.
A report by McLaughlin (2014) suggests that companies without a clear plan for knowledge transfer of their business processes, functionalities, and procedures from long-serving staff to their younger counterparts face serious business continuity risks, because knowledge gaps may have a severe effect on the future of the company.
Additionally, the contemporary trend of demographic changes, including the Baby Boomer generation reaching retirement age, high staff turnover of skilled mid-career staff, and the increasing challenge of employing, training and retaining younger employees, further highlights the necessity of knowledge transfer and the introduction of new knowledge from KEEN affiliates and KTP Associates for business sustainability.

McLaughlin (2014) argued that changing business environments combined with increased technical, managerial, and scientific expertise in companies over the last thirty years may mean that when staff leave a company, they are likely to be leaving with knowledge and expertise crucial to the future prospects of the company.

This challenge of knowledge transfer is applicable to the KEEN affiliates and KTP associates, who act as carriers of university and graduate skills and knowledge to the business partner. If the graduate leaves prior to the completion of the project, and without documentation of the knowledge brought into the company, this may pose business continuity risks, especially for small start-up businesses (SMEs) who may rely on the skills and expertise of the graduate and university to complete important business projects, and may not have the skills in-house to complete the project.

## 3.1 Conclusion

The survey of the literature has provided a wealth of background information and knowledge which showcases the importance and reach of a variety of knowledge transfer initiatives aimed at improving the competitiveness of firms. It has highlighted the fact that “knowledge transfer” is not a simple “handover” but a complex undertaking which is affected, for example, by financial and technical factors and/or the degree of technical difficulty, together with cognitive, emotional, and psychological issues which can facilitate or hinder a transfer. Several models provided indicators of potential use in the evaluation of different stages in the knowledge transfer process. Whilst no single model manifested as being a perfect fit, the evaluation found that the Szulanski (2000) model of knowledge transfer was capable of being modified and adapted as an organising framework for identifying and measuring the effectiveness of the KEEN approach to stimulating and improving innovation and business processes in SMEs in the West Midlands.

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# 5.1 Appendices

## Appendix 1 - Summary of Models

### Table A1: Summary of the short-listed models of knowledge transfer

| No. | Model/Rationale | Author(s) | Features | Dynamics |
|---|---|---|---|---|
| 1. | **UBC (University/Business Collaboration Model)**<br><br>The formation of UBC is important in building a knowledge economy/society. At the direct level, outcomes include knowledge transfer as well as the contribution to research and teaching programmes within universities.<br>(See comments Appendix 2A) | Davey et al. (2011) | The relationship between businesses and universities in the EU is influenced by a range of different factors. This begins with stakeholders such as the HEIs, government (supra-national, national, and regional) and business. These stakeholders then influence the 'action' level where the four pillars are set. This includes strategies, structures, approaches, activities, and frameworks which set the conditions for UBC. The 'four pillars' then influence the result level where the perceived benefits, drivers and barriers plus situational factors all influence the possibility for UBC.<br><br>The model also provides an understanding of why academics and researchers engage in UBC. This is based on understanding elements such as situational factors (i.e. time in faculty/school, and age etc.), alongside benefits and barriers (i.e. access to funding). | There are eight types of UBC identified from the model. These are Collaboration in R&D, Academic Mobility, Student Mobility, Commercialisation of R&D Results, Curriculum Development and Delivery, Lifelong Learning, Entrepreneurship, and Governance. This implies that UBC is more than the creation of new IP such as patents, licenses, and copyrights |
| 2. | **Knowledge-to-Action Process**<br>(See comments Appendix 2B) | Graham et al. (2006) | 1: Knowledge Creation (knowledge inquiry, knowledge synthesis, knowledge tools/products. Knowledge is also tailored). There is then a seven step action process<br>1: Identify problem, identify review, select, knowledge<br>2: Adapt knowledge<br>3: Assess barriers<br>4: Select, tailor, implement interventions<br>5: Monitor knowledge use<br>6: Evaluate outcomes<br>7: Sustain knowledge use | Knowledge becomes more refined as it moves through the cycle. Action cycle represents the implementation of knowledge. This framework is used in non-business activities such as mental health. |

| No | Model/Rationale | Author(s) | Features | Dynamics |
|---|---|---|---|---|
| 3. | **Communication Perspective of KT**<br><br>New knowledge is created most rapidly when there is a move from one knowledge 'conversion' to another. The transfer of tacit knowledge is critical in the knowledge transfer flow between universities and business.<br>(See comments Appendix 2C) | Nonaka & Takeuchi (1995) | The model has four interactive points, which are socialisation (tacit to tacit), externalisation (tacit to explicit), combination (explicit to explicit), and internalisation (explicit to tacit). | Socialisation-Knowledge is exchanged through joint activities and group learning. Externalisation-Knowledge is transferred through theories, concepts, models, analogies, and metaphors. Essentially, intuitions or images are converted into tangible statements (Rynes et al, 2001). Combination-Knowledge from different disciplines is evaluated for any common themes or differences. This could be transmitted by academics through the publication of books and papers etc. Internalisation-Possibility for academics to create new theories plus implementation. |
| 4. | **Factors in the Knowledge Transfer Process**<br><br>The model displays the multiple roles the knowledge source requires to exert influence over the existing organisational structure and culture, to accommodate and embed new philosophies and knowledge.<br>(See comments Appendix 2D) | Lyons (2009) | 1: Characteristics of knowledge source<br>2: Firm culture<br>3: Firm effectiveness<br>4: Capability elements<br>5: Sustainability of knowledge transferred.<br><br>The circular flow of the model feeds into the bottom half of the model and this will directly impact on achievement of objectives. At the same time, these are being changed and affected by a range of individual and collective traits (capability elements) which affect knowledge transfer. | In contrast to linear approaches, this model indicates that as the firm culture, resources, systems and practice gradually change and evolve, so the roles of the knowledge source and recipient are continually modified according to the desired state of knowledge at any given time. |

| No | Model/Rationale | Author(s) | Features | Dynamics |
|---|---|---|---|---|
| 5. | **Model to measure transfer collaboration**<br><br>Framework defines the impacts of KT between universities and business. Impacts result from combination of three dimensions. (See comments Appendix 2E) | Rossi et al. (2014) | 1: Reach (who benefits)<br>2: Value created (what benefits are received)<br>3: Time (taken for benefits to become apparent) | Over time it is expected that range of stakeholders who benefit from the KT process will increase, as will the variety of benefits. |
| 6. | **Displays key links between the creation and use of knowledge in the partnership**<br><br>Tacit knowledge at the university will eventually become explicit knowledge for the business or industry partner. (See comments Appendix 2F) | Sherwood et al. (2004) | University partner (early stages of knowledge development)<br>Interface (social and physical context for knowledge transfer). This interface provides the frameworks surrounding partner selection, negotiation and structuring. The knowledge is then transferred from the interface to the business or industry partner (later stages) where knowledge is developed further. | Knowledge will mainly flow from university to the business partner. |
| 7. | **Process of Knowledge Transfer**<br><br>Based on understanding that there are four main stages to knowledge transfer. (See comments Appendix 2G) | Szulanski (2000) | Broken down into stages and milestones, the stages are: initiation, implementation, ramp-up, and integration.<br><br>• Initiation Stage: Events that lead to transfer<br><br>• Implementation: Decision to proceed<br><br>• Ramp-up: Recipient starts using knowledge<br><br>• Integration: Use of the transferred knowledge becomes routinized | Issues with 'stickiness' and difficulties in KT process are influential in this model. Range of impacts can also vary dependent on the stage that the firm is at. Also, a firm can become 'stuck' at a certain stage. |

| No. | Model/Rationale | Author(s) | Features | Dynamics |
|---|---|---|---|---|
| **8.** | **Process model for KT in open innovation (Generic)**<br><br>The Generic Model highlights the key stages which a successful innovation project will display.<br>(See comments Appendix 2H) | Ternouth et al. (2012) | 5Cs:<br>C1: Company Opportunity<br>C2: Co-Recognition<br>C3: Co-Formulation<br>C4: Co-Creation<br>C5: Commercialisation<br>Barriers to KT are present at each of these stages. | A business will initially identify the need for new knowledge in order to solve a business problem. In order to gain this knowledge, the business will seek a partner university. Within the university, appropriate academics/and or research will be identified, and this knowledge is then transferred and adapted to the businesses requirements. The knowledge is then used to help the firm innovate, and if this is successful it is transferred into a market solution. |
| **9.** | The model connects the various aspects of **absorptive capacity** together. This includes the antecedents, moderators, and outcomes. External sources of knowledge are important in formulating absorptive capacity. Also, certain triggers will activate ACAP.<br>(See comments Appendix 2I) | Zahra & George (2002) | Model begins with the Antecedents of ACAP (external knowledge sources).<br><br>The model defines absorptive capacity as potential and realized. Potential ACAP refers to acquisition and assimilation of knowledge whilst Realized ACAP refers to transformation and exploitation.<br><br>These aspects can then effect a competitive advantage. | Firm experience will affect the search for knowledge sources (i.e. successes/failures).<br><br>Activation triggers- Moderate the impact of knowledge sources. Could be internal (i.e. crisis) or external (i.e. technology)<br><br>Knowledge is then shared in firm (social integration mechanisms). Can be informal (social networks) or formal (coordination). This could help to reduce gap between potential and realized ACAP. |

# Appendix 2: Knowledge Transfer Models

## Introduction

Knowledge Transfer is often a complex process and for this reason there are few studies which provide a holistic time series perspective which demonstrates the mechanisms, the facilitators, enablers, and barriers endemic within such a project, whether large or small. Most existing models are snapshots in time rather than the following of a process from beginning to end, but even so, they contain pointers and evaluation which assist in the definition of an appropriate research framework. The insights help to inform perspectives and save time in the initial stages.

## Summary of the relevance of the KT models to the KEEN research project

For the purpose of this study, there is a need to devise a framework which is capable of specific application to the KEEN process; therefore, it is considered that existing models are not wholly relevant as they specifically focus upon, variously, the psychological processes, wholly macro issues, financial benefits, partnership structures etc., which do not provide either, or both, a longitudinal perspective or a multifactor diachronic analysis, although some of the models suggest that the micro aspects (i.e. those within the relationship) may be of particular importance. Where the evaluated models take account of micro aspects, they are not sufficiently aligned to the KEEN programme, structure and conditions. Nevertheless, the review has been useful in terms of appropriate issues which need to be incorporated into the research process. Subject to the outcomes of the research, there may be the opportunity to devise a model which is of specific relevance to the knowledge exchange process present in the KEEN projects.

# Appendix 2A: Model 1 – UBC (University/Business Collaboration)

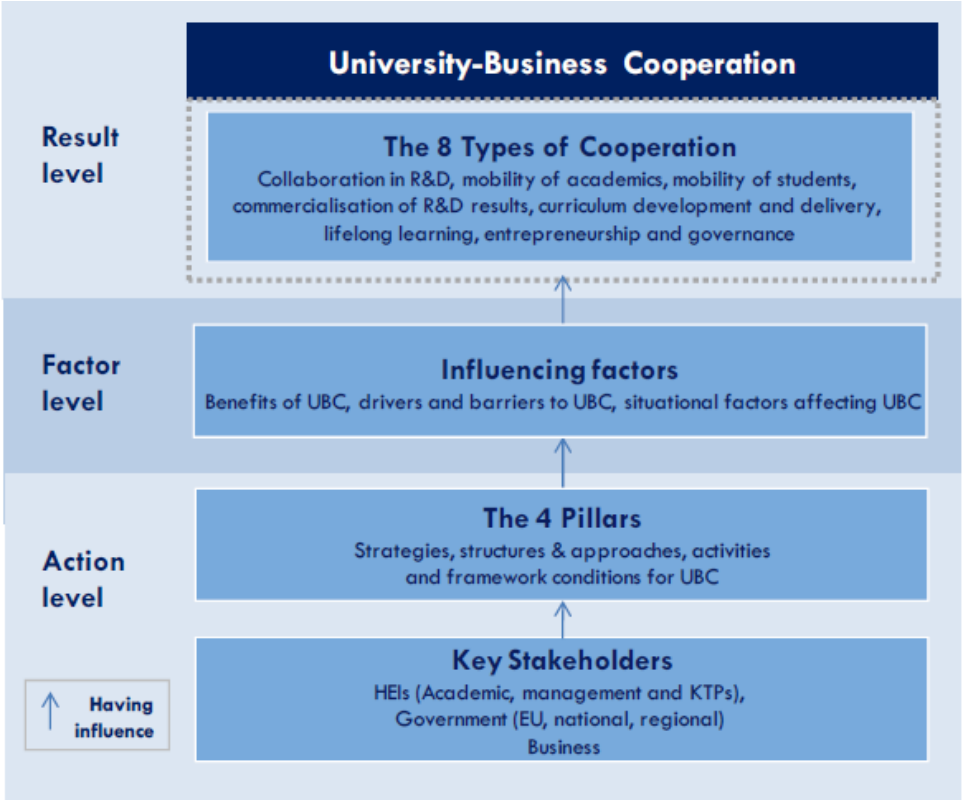


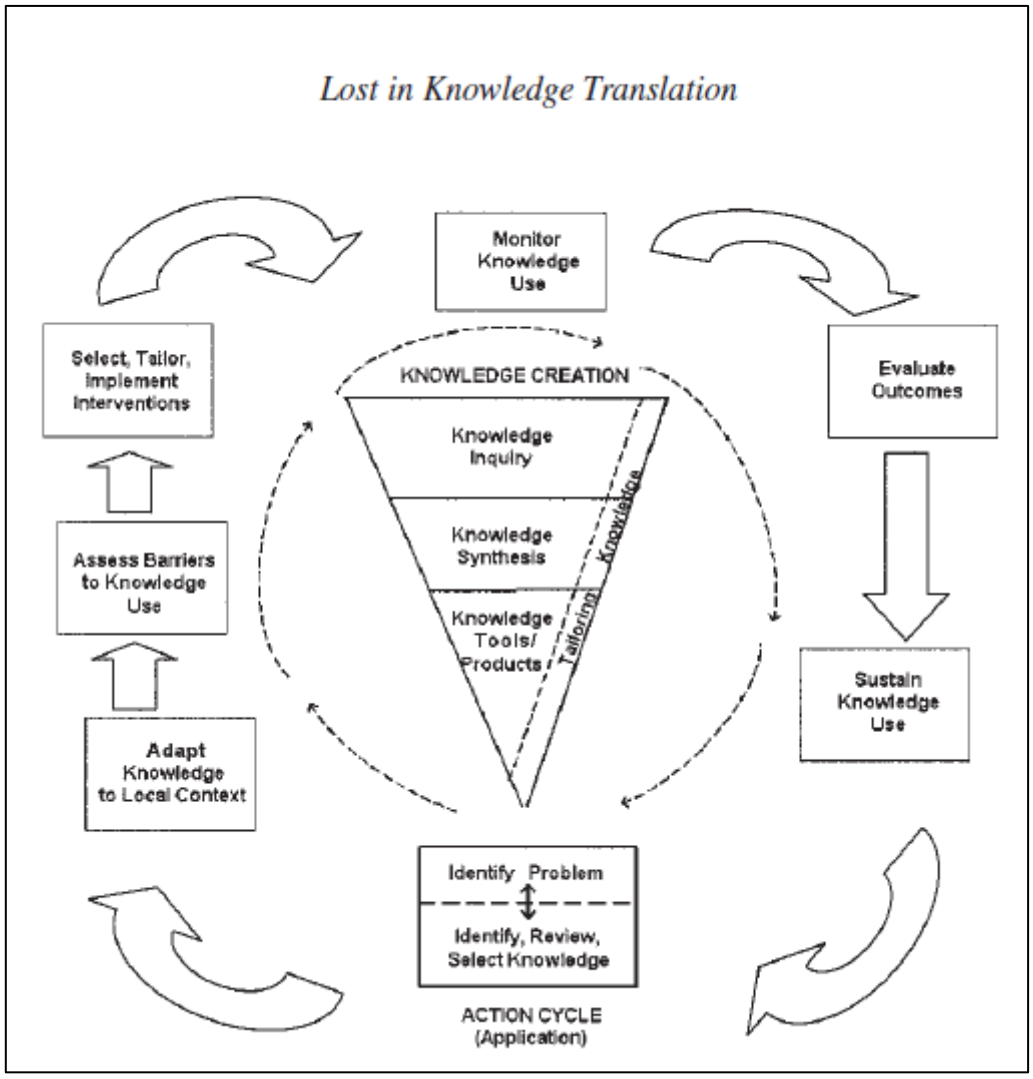

**Figure A2.1 University/Business Cooperation (UBC) Model**
**Source**: Davey et al., 2011

The UBC model (Figure A2.1) starts with the 'key stakeholders' who generate the co-operation, alongside the four pillars which will influence the extent of UBC. These aspects then influence the 'Factor Level' where there are influencing factors, which in turn affect the types of cooperation established.

Unlike models (such as Nonaka and Takeuchi, 1995) which deal with the micro processes of knowledge transfer within the firm, the UBC Model reflects on the wider macro issues involved in identifying a knowledge transfer programme. This model does not fully establish how knowledge is transferred within an organisation, and is therefore not wholly suitable for this project. However, the model does contain a consideration of benefits and drivers which can be important in understanding the process of knowledge transfer. In Rossi et al. (2014), there is an identification of the benefits for different stakeholders, and the establishment of some motivations which influence academics to engage in knowledge transfer.

## Appendix 2B: Model 2 – Knowledge-to-Action Process Framework

This model is the Knowledge-to-Action Process framework. Unlike the other models evaluated in this report, this model was devised from a particular sector of activity (healthcare). This is shown in Figure A2.2:




**Source**: Graham et al. (2006): Lost in Knowledge Translation: Time for a Map

**Figure A2.2. Knowledge-to-Action Process Framework**

This model was initially devised for activities concerning healthcare in North America. The model does not contain some influential business concepts such as absorptive capacity. Also, unlike Szulanski (2000) who reflects that knowledge transfer can become stuck at various stages, this model does not suggest that the process of knowledge transfer can encounter 'stickiness.' Although barriers are linked to the model, they are not explained in terms of each stage (such as the 5C framework). However, the model is limited in that this simply outlines the stages which knowledge transfer must pass through, and in terms of establishing an analytical framework the model is insufficient because aspects such as motivations or objectives of knowledge transfer are not examined.

# Appendix 2C: Model 3 – Communication Perspective of KT – Knowledge Conversion Model

| | |
|---|---|
| Explicit to tacit<br>(Internalisation)<br>e.g. learn from a report | Tacit to explicit<br>(Externalisation)<br>e.g. dialogue within team, answer questions |
| Tacit to tacit<br>(Socialisation)<br>e.g. team meetings and discussions | Explicit to explicit<br>(Combination)<br>e.g. e-mail a report |

**Figure A2.3. Knowledge Conversion Model**
**Source:** Nonaka and Takeuchi (1995)

Explicit means: clear, specific, and unambiguous knowledge
Tacit means: implied and unspoken knowledge

The model (Figure A2.3) is useful in establishing whether any knowledge brought into a firm by an academic (i.e. tacit knowledge) is converted to explicit knowledge which is disseminated throughout the firm. The model could also be used to reflect the understanding of knowledge within a firm, and what capability exists but is unknown, or is not being utilised within the firm.

The model highlights the four dimensions in which knowledge can be transferred within an organisation, but it does not reflect the motivations or benefits involved in a knowledge transfer programme. Therefore, for our purposes, although this model is not wholly appropriate, it does offer some insights into how knowledge is transferred. For instance, during socialisation, an individual can pass on knowledge to another person in the manner of an apprenticeship (Ternouth et al., 2012). In this particular aspect of knowledge transfer, individuals will share experiences in order to transfer knowledge.

In externalisation, employees of a company who are encouraged and motivated to do so can make recommendations about product improvement by articulating knowledge accumulated over a number of years. In combination, knowledge can be transferred from outside of the firm into the firm through IT processes such as databases or emails. Additionally, this form of knowledge transfer can also occur through reports as they may bring together knowledge from different aspects of the organisation. Finally, internalisation can relate to 'learning by doing.' This can be in the form of training programmes or employees reading documents or manuals about their job (Nonaka and Takeuchi, 1995). Although Nonaka and Takeuchi (1995) identify that there are both tacit and non-tacit forms of knowledge, this model does not highlight how the exchange of knowledge can be negatively affected by difficulties arising in the firm. The four stage Szulanski model (2000) uses 'stickiness' to highlight how knowledge transfer cannot pass through various stages.

## Appendix 2D: Model 4 – Factors in the Knowledge Transfer Process

This model is informed by Szulanski's work, which emanated from doctoral research developed by Lyons (2009). This is shown in Figure A2.4.

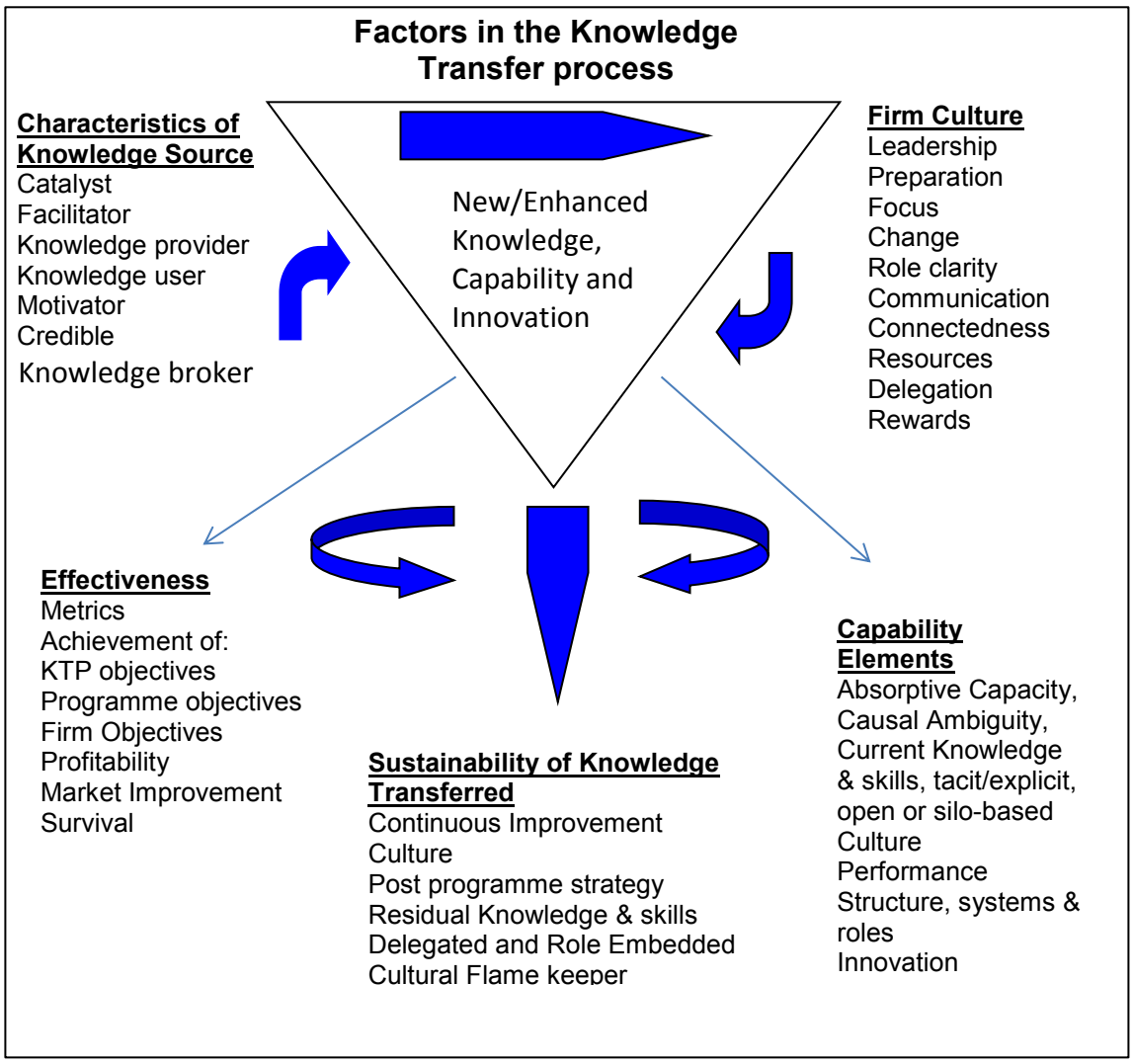



**Figure A2.4. Factors in the Knowledge Transfer Process**
**Source**: Adapted from Lyons (2009): A Diachronic examination of the Process of a Knowledge Transfer Partnership in creating a Marketing Capability in a Small Firm

The factors involved in the Knowledge Transfer Process model are non-linear. This implies that as aspects such as firm culture, resources, systems, and processes change, so will the roles of the knowledge source and recipient (Lyons, 2009). As with Szulanski, this states the knowledge transfer process to be dynamic. There is a circular flow of knowledge into the bottom half of the model and this will directly impact upon the achievement of the objectives (shown under effectiveness). The ability to achieve these objectives is also influenced by the capability elements, which includes issues such as absorptive capacity. An advantage of this model is that it considers the micro issues concerning the knowledge transfer process. Therefore, specific issues within a firm (such as absorptive capacity), can be related directly to the knowledge transfer process. Other firm specific issues (such as those under firm culture) can create an extensive list of variables, which can make the analysis of knowledge transfer more difficult. Each

organisational culture would need to be assessed before the analysis of the knowledge transfer process could begin. The models already identified in this report have focused on some of the micro aspects of knowledge transfer.

## Appendix 2E: Model 5 –Model to Measure Transfer Collaboration

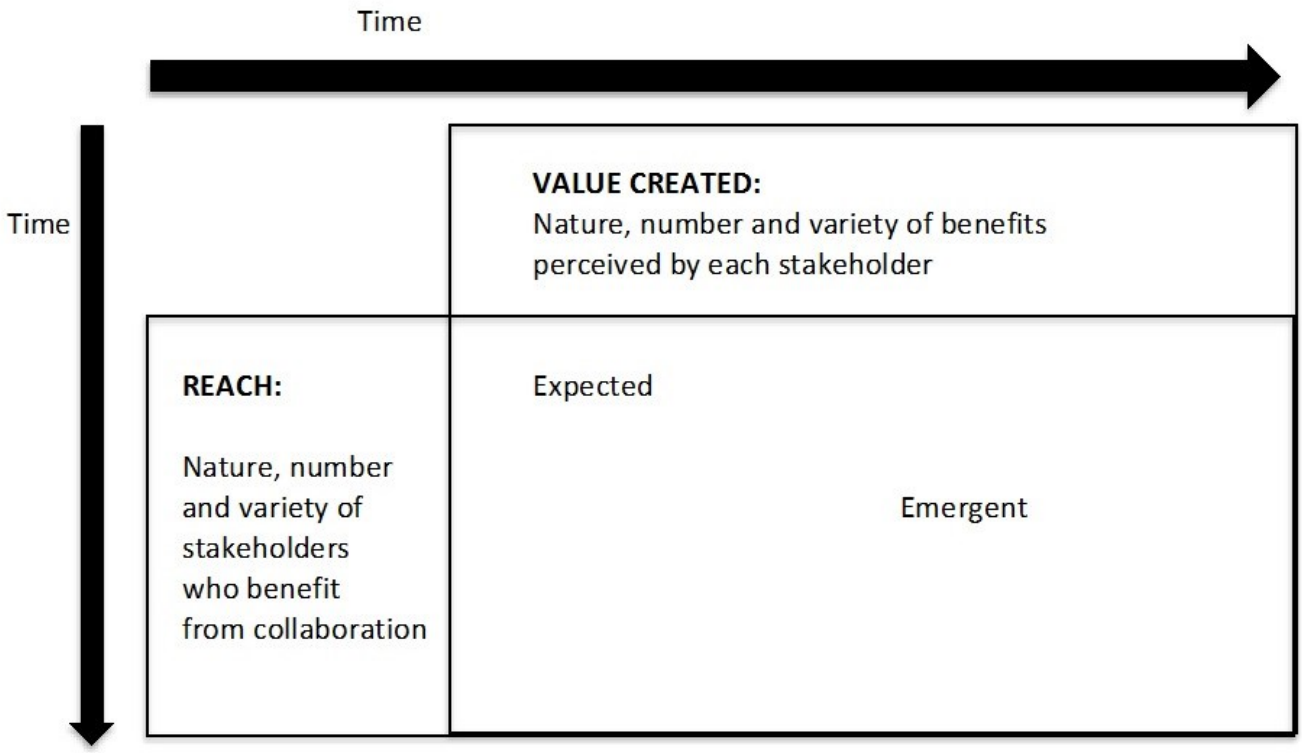



**Figure A2.5. Model to Measure Transfer Collaboration**
**Source**: Rossi et al., 2014: Assessing the impact of university-industry collaboration: a multi-dimensional approach

The model shown in Figure A2.5 has three dimensions which influence knowledge transfer. These are reach, value created, and time. The reach aspect of the model refers to the stakeholders who benefit from the collaboration. Value refers to the benefits each of the stakeholders receives. The third element of time is particularly important as this indicates that the reach and value parts of the model can change over time. Therefore, benefits are dependent on the stage that the intervention is at, as different stakeholders will benefit in different ways. This model not only reflects the dynamic nature of business/university collaboration, but also enables expectations of the academic, associate, and the business to be compared with the actual benefits.

A weakness of other models is a failure to address the range of benefits, and this model is particularly effective at addressing this aspect. The model also extends the work of Bozeman (2000) who established that there were different stakeholders who benefited from a knowledge transfer project. However, by creating the 'reach' dimension, the Rossi et al. (2014) model is able to consider the variety, number, and nature of stakeholders.

For the purpose of KEEN evaluation, one limitation of the Rossi model is that it does not wholly address the types of knowledge transfer which can occur in an organisation. These are summarised by Nonaka and Takeuchi (1995), who developed the knowledge conversion model to explain how knowledge is disseminated.

## Appendix 2F: Model 6 – Links between the Creation and Use of Knowledge in the Partnership – the University/Industry Knowledge Chain

A model which focuses on the macro element is Sherwood et al. (2004). This is the university/industry knowledge chain, and is shown below in Figure A2.6.

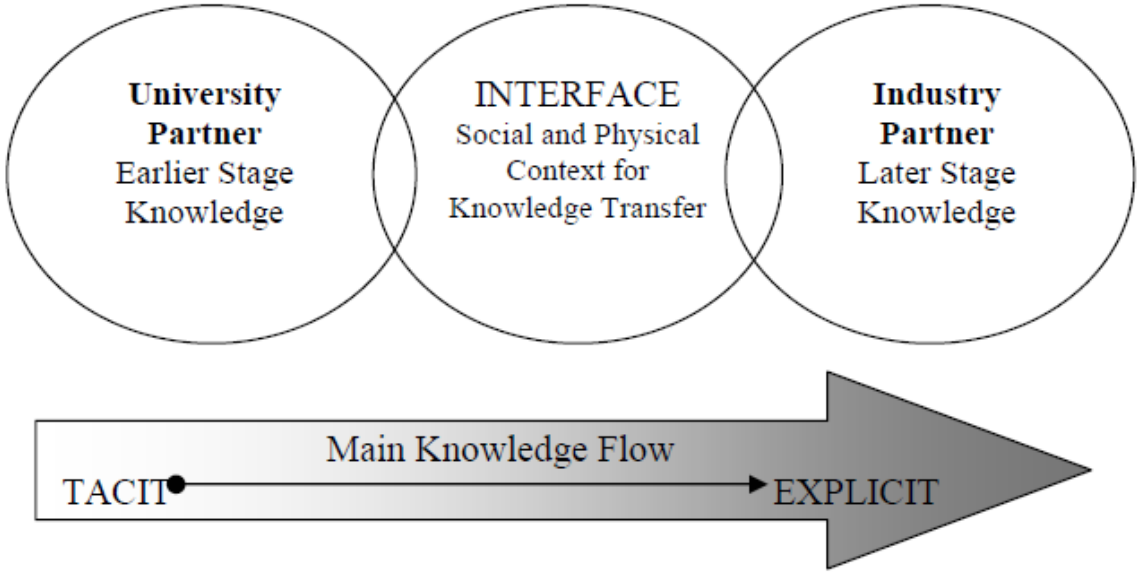



**Figure A2.6. University/Industry Knowledge Chain**
**Source**: Sherwood et al. (2004): Partnering for Knowledge: A Learning framework for University-Industry Collaboration.

The model devised by Sherwood et al. (2004) begins with an understanding that knowledge is created within the university before entering an interface, which is between the university and the business. The business (industry partner) will then take this knowledge, and cultivate it further to develop products, process, or services. However, there is little explanation in this model of how knowledge is transferred within the organisation. The notion of an 'interface' does not highlight the process used by the firm to evaluate knowledge the internal knowledge transfer process. The model is also based on a North American perspective, and represents the internal knowledge transfer process. In contrast, Davey et al. (2011) focuses on KT across European institutions and reflects the wider university/business relationship.

## Appendix 2G: Model 7 – Process of Knowledge Transfer – Four Stages Model

Szulanski's (2000) work, despite emerging from a large scale quantitative study of MNEs, has concepts which are equally applicable to small firms and presents a wider perspective of knowledge transfer. This is shown in Figure A2.7 below.

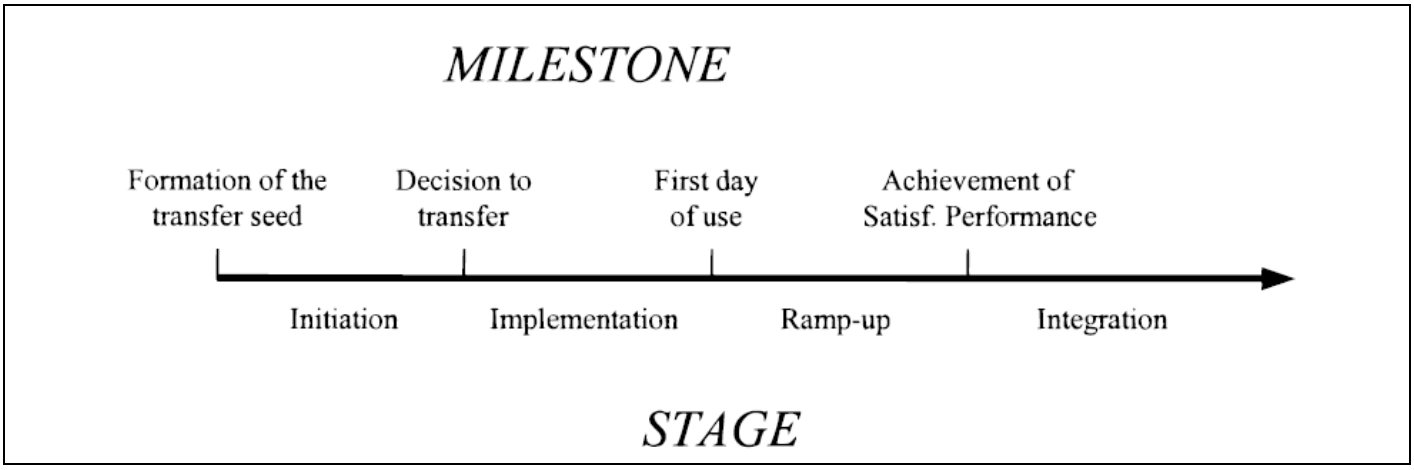



**Figure A2.7. Four Stages Model**
**Source**: Szulanski (2000): The process of Knowledge Transfer: A Diachronic Analysis of Stickiness

The four stages model developed by Szulanski (2000) identifies the stages that a knowledge transfer process can pass through in an organisation. These are summarised in Figure A2.8:

| Initiation | Implementation | Ramp-up | Integration |
|---|---|---|---|
| Awareness of problem, agreement on knowledge required | Exchange of knowledge and information, source and recipient | Identification and rectification of problems in order to ensure successful application of knowledge transferred | Use of new knowledge as routine; phasing out of old knowledge. |

**Figure A2.8. Stages in the Knowledge Transfer Process**
**Source**: Lyons (2009) A Diachronic examination of the Process of a Knowledge Transfer Partnership in creating a Marketing Capability in a Small Firm

However, due to the presence of 'stickiness,' it is possible for a project to encounter a barrier at any of the stages in the model. For instance, at the initiation stage, Szulanski (2000) suggested that firms faced difficulties in recognizing opportunities for knowledge transfer. In such cases where this cannot be overcome, the project will remain stuck in the first stage (see Figure A2.9).

This model was developed from large firm research but the structure allows it to be used in the small firm arena due to the generic categories which are embedded. The more detailed framework seen below

can also be applied to the SME, but in diachronic research it is much more difficult to articulate multiple qualitative findings in a coherent manner (Lyons, 2009).

| Characteristics of Knowledge and Stickiness | Characteristics of Knowledge Source and Stickiness | Characteristics of Knowledge Recipient and Stickiness | Characteristics of Organisational Context and Stickiness |
|---|---|---|---|
| Unproven Knowledge, Causal Ambiguity | Source Motivation, Source Credibility | Recipient Motivation, Absorptive Capacity, Retentive Capacity | Arduous Relationship with the Source, Barren Organisational Context |

**Figure A2.9. Characteristics of Knowledge Stickiness**

Within Szulanski's (2000) model, he further identifies barriers specific to particular aspects of knowledge transfer; if not overcome, such barriers will affect the potential impact of knowledge transfer in both large firms and SMEs (Lyons, 2009).

A further benefit of the Szulanski model is that the impacts and benefits of knowledge transfer are acknowledged to be dependent on the stage the process is at. This can enable expectations (of the business, academic, and affiliate) to be evaluated, and this is particularly useful when evaluating programmes such as KEEN.

# Appendix 2H: Model 8 – Process Model for KT in Open Innovation (Generic) – the 5C Framework Model

The '5C framework' is a generic model used by Ternouth et al. (2012), and it contains five stages which successful innovation projects must display. The five stages are company opportunity, co-recognition, co-formulation, co-creation, and commercialisation. This is shown in Figure A2.10:

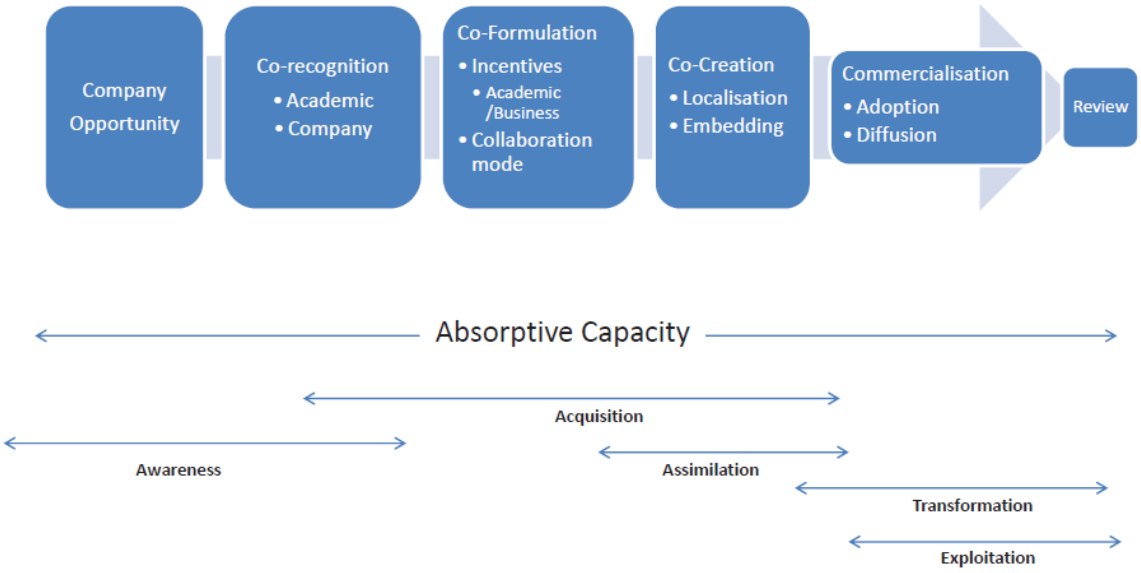



**Figure A2.10. 5C Framework**
**Source**: Ternouth et al. (2012): Key Attributes for Successful Knowledge Transfer Partnerships

The 5C framework begins with an identification of a business problem (or opportunity) which can be resolved through the identification of new knowledge. Once the company has found an appropriate university partner (co-recognition), knowledge can be translated into the requirements of the organisation (co-formulation), before beginning work on the innovation process (co-creation) and then commercialising the new knowledge at the final stage (Ternouth et al., 2012).

However, the model does have some limitations. When it comes to the commercialisation stage of the framework, the benefits here are quite narrowly focused. Rather than considering other stakeholders (like the academic or the associate), the commercialisation aspect focuses on the business outcome whereas knowledge benefits can occur at different stages of the project, and they are not built into this model. Therefore, the 5C framework is inadequate at assessing the whole range of benefits which can be generated by a project.

One feature of the 5C Model is absorptive capacity. Absorptive capacity is the ability of an organisation to recognise, utilise, and assimilate new knowledge for commercial means (Cohen and Levinthal, 1990). Although this is part of the 5C framework, absorptive capacity can also be modelled as shown by Zahra and George (2002). This is model nine, which is described in the next Appendix, 2I.

## Appendix 2I: Model 9 – A Model of Absorptive Capacity

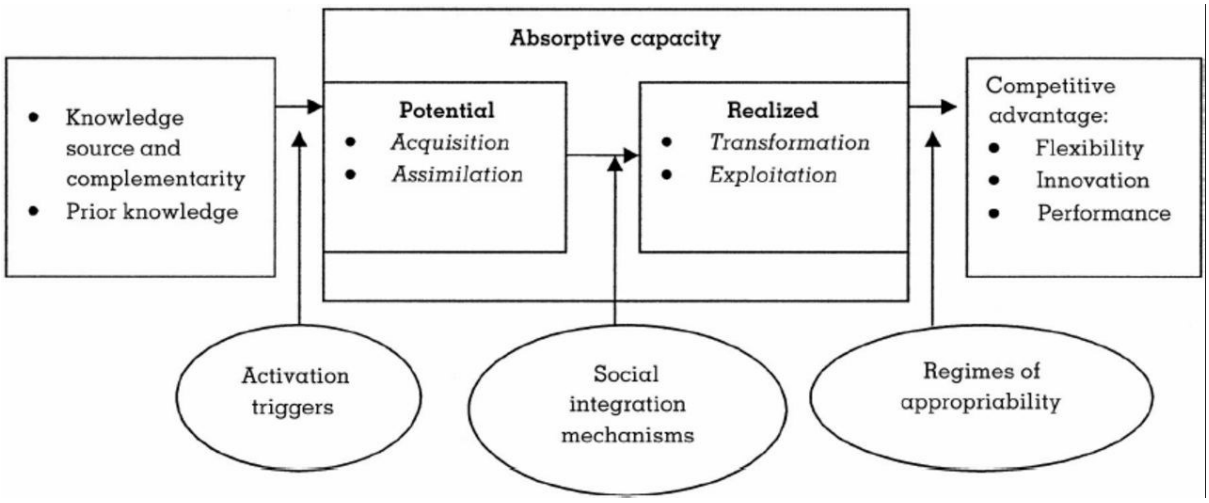



**Figure A2.11. A Model of Absorptive Capacity**
**Source**: Zahra and George, 2002, Absorptive Capacity: A Review. Reconceptualization and Extension

The model developed by Zahra and George (2002) re-conceptualises absorptive capacity as a construct which is related to knowledge, and not just business process (Ternouth et al., 2012). The model (Figure A2.11) itself highlights that absorptive capacity is a dynamic capability, with the creation and utilization of knowledge affecting firms' competitive advantage. As part of the model, Zahra and George (2002) suggested that absorptive capacity has two sub groups, which are potential absorptive capacity (how receptive a firm is to new knowledge) and realized absorptive capacity (how external knowledge can be used) (Ternouth et al., 2012). As part of these two sub groups there are also four dimensions of absorptive capacity. Potential absorptive capacity contains acquisition and assimilation, and realized absorptive capacity contains the transformation and exploitation dimensions. In a KEEN or KTP Project, the search for knowledge can be considered in these two ways, as some of the projects focus on market research, whilst others are designed to address areas of design and technology. Market research identifies new markets, new products and new applications for existing products in addition to useful competitor information which assists in informing future innovation and strategic direction.

With absorptive capacity identified through the Zahra and George (2002) model, Rossi et al. (2014) investigate the benefits of knowledge transfer across a range of different stakeholders. The importance of stakeholders in knowledge transfer is reflected in Rossi et al. (2014), who consider the benefits to a range of different interested parties. This model measures transfer collaboration and was designed in order to evaluate KTP projects. This model is Model 5 described in Appendix 2E.

# Appendix 3: Statistics of businesses in the West Midlands and the Black Country

## Appendix 3A: SMEs in the West Midlands

The West Midlands recorded a steady increase in the number of business enterprise from 2009-2012 apart from 2010, where it had a decrease in the number of enterprises that year from 2009 of 560 enterprises. The decrease in enterprises in 2010 was reflected within every region across England besides London and the South East (ONS, 2013).

Between 2009 and 2012, the West Midlands recorded the fifth lowest number of new enterprises of the nine English regions. This view of the West Midlands for business growth is reinforced by the Department for Business Innovation and Skills, which identified that the West Midlands was also fifth out of nine regions for innovation in business between 2011-2013 (Willetts, 2014). However, a recent report by Rhodes (2014) to the Houses of Parliament on SMEs suggests that in the year 2014, the West Midlands region had a higher number of businesses per 10,000 residents than that of the East Midlands, the North West, Wales, Northern Ireland, Yorkshire and Humber, Scotland, and the North East; however, it was lower in number in comparison to London, the South East, the South West, the East of England, and the UK as a whole.

## Appendix 3B: Business Growth Rate in the Black Country and West Midlands

Business growth is made up of the increase or decrease in business start-ups in any one year. According to statistical data from the Office of the National Statistics (ONS, 2013), the West Midlands business growth rate between 2009 and 2012 was relatively lower than the growth rates for the South East, London, the whole of England, and the nationwide average (see the figures in Table A3.1). While it is understandable that most UK regions experienced a negative growth figure in 2010, given the impact of the financial crisis, the negative growth rate of the West Midlands at -2.41% in 2010 exceeded the negative growth rate of England at -0.72%, and nationwide at -0.37%. However, the region suffering the highest negative growth in 2010 was Wales, at -9.85% (ONS, 2013).

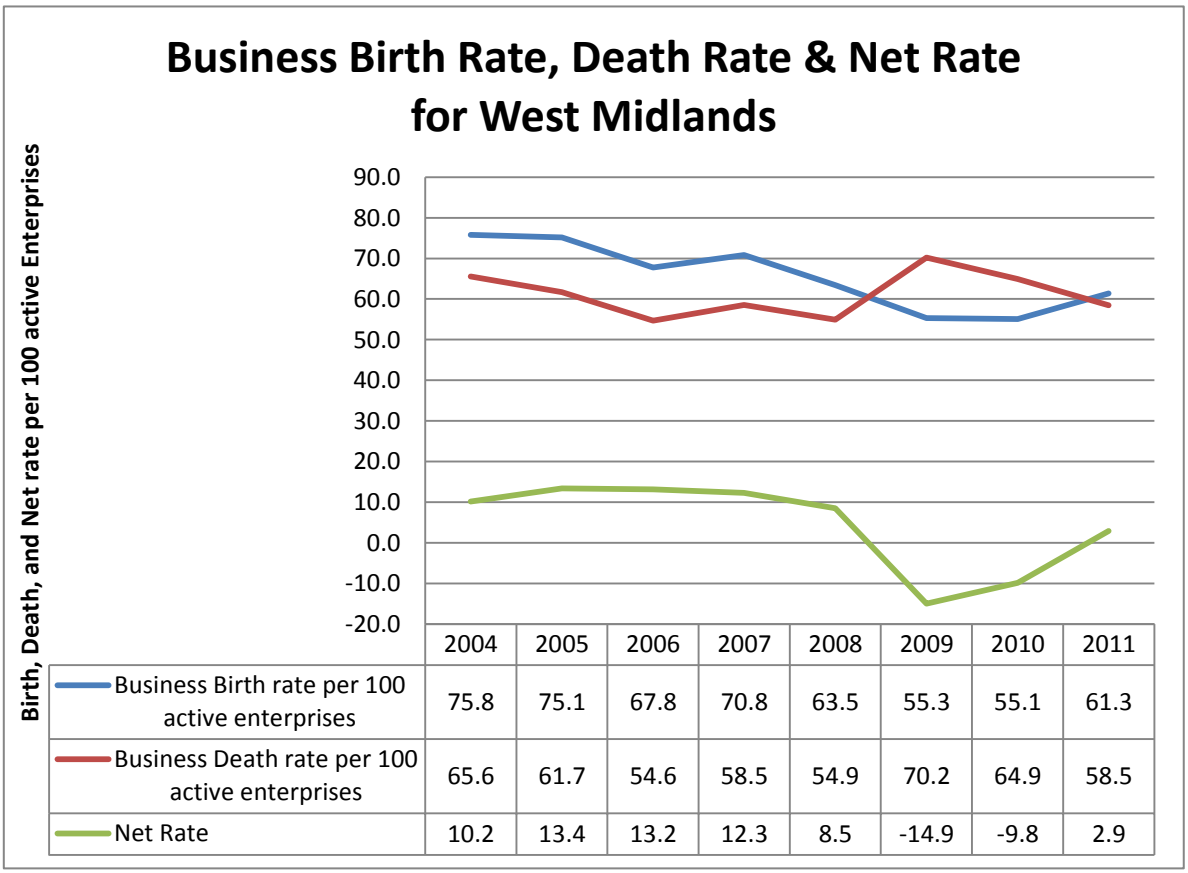
| | | 2009 | 2010 | 2011 | 2012 |
|---|---|---|---|---|---|
| **WEST MIDLANDS** | Number of new businesses | **18,245** | **17,805** | **19,555** | **19,650** |
| | Growth rate | | -2.41% | 9.83% | 0.49% |
| **SOUTH EAST** | Number of new businesses | **36,320** | **36,910** | **40,775** | **41,245** |
| | Growth rate | | 1.62% | 10.47% | 1.15% |
| **LONDON** | Number of new businesses | **50,575** | **52,755** | **61,395** | **65,095** |
| | Growth rate | | 4.31% | 16.38% | 6.03% |
| **ENGLAND** | Number of new businesses | **209,035** | **207,520** | **232,460** | **239,975** |
| | Growth rate | | -0.72% | 12.02% | 3.23% |
| **WALES** | Number of new businesses | **8,325** | **7,505** | **8,225** | **8,270** |
| | Growth rate | | -9.85% | 9.59% | 0.55% |
| **SCOTLAND** | Number of new businesses | **14,725** | **15,530** | **16,940** | **17,385** |
| | Growth rate | | 5.47% | 9.08% | 2.63% |
| **NORTHERN IRELAND** | Number of new businesses | **3,945** | **4,590** | **3,745** | **3,935** |
| | Growth rate | | 16.35% | -18.41% | 5.07% |
| **Nationwide figure** | Number of new businesses | 236030 | 235145 | 261370 | 269565 |
| | Growth rate | | -0.37% | 11.15% | 3.14% |

**Table A3.1. Business Growth: Number of new businesses created per year**
**Source: Adapted and created from Office of National Statistics figures (ONS, 2013).**

The relatively low business growth in the West Midlands post 2009 in comparison to other regions definitely supports the need for direct intervention and business support through KEEN and KTPs in the region.

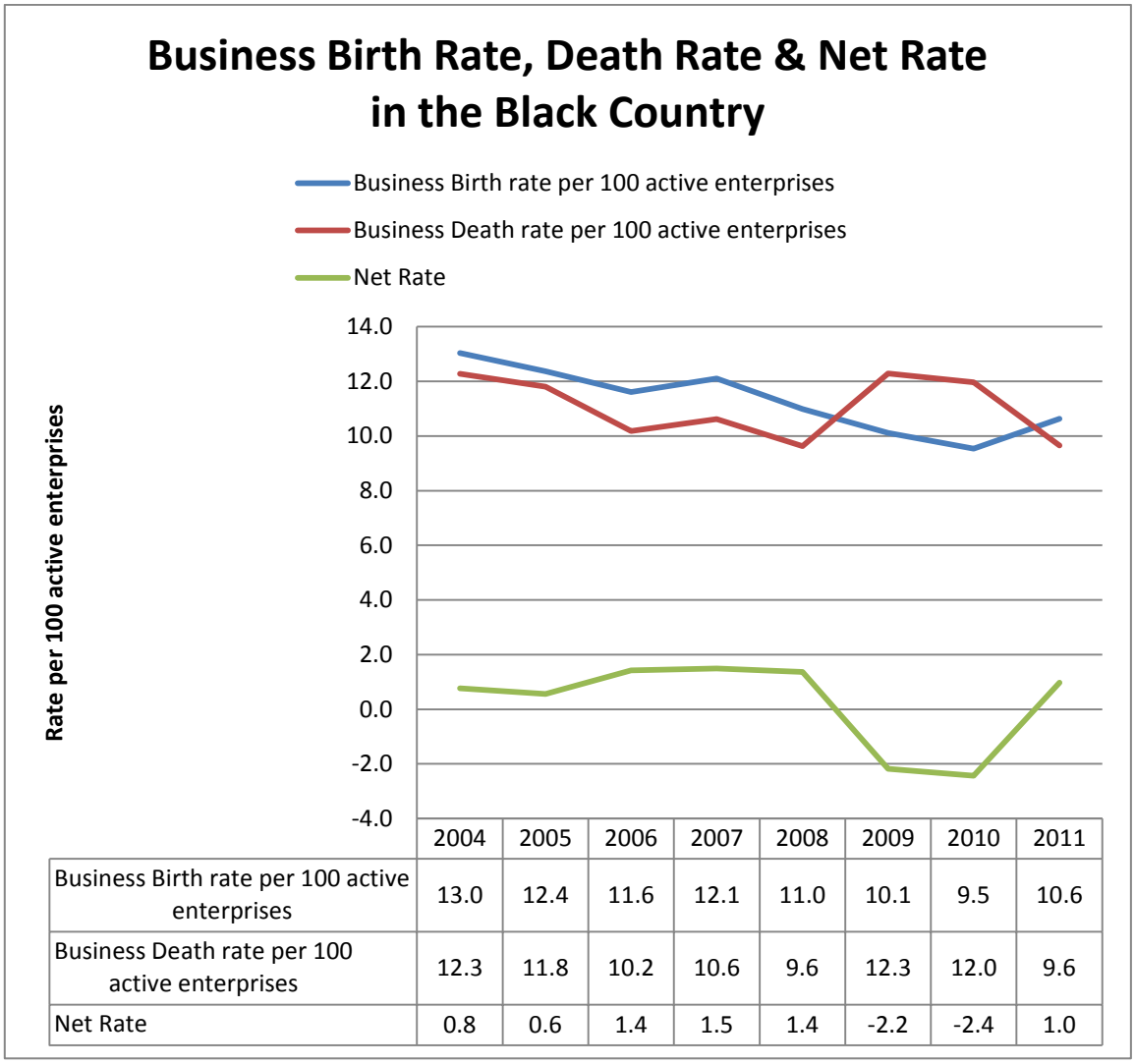
## Appendix 3C: Business Birth Rate, Death Rate and Net Rate in the Black Country and West Midlands

Business birth rate is the annual number of business start-ups (Monaghan, 2014). However, business death rate is the annual rate at which active businesses close down in the reporting year (Rhodes, 2014). The net rate is the annual difference between the birth rate and death rate of businesses in the West Midlands (ONS, 2013). ONS figures for business birth, death and net rates for the West Midlands (Figure A3.1) and the Black Country (Figure A3.2) suggest a decline in business birth rate between 2004 and 2011, from 13 business births per 100 active enterprises in 2004, to 10.6 in 2011 for the Black Country, and 75.8 business births per 100 active enterprises in 2004, to 61.3 in 2011 for the West Midlands region. The years 2009 and 2010 showed a negative net rate (business birth rate minus business death rate), with business death rate being higher than business birth rate during the financial crisis period, caused by the subprime loan debacle in the western hemisphere (ONS, 2013).




| | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 |
|---|---|---|---|---|---|---|---|---|
| Business Birth rate per 100 active enterprises | 75.8 | 75.1 | 67.8 | 70.8 | 63.5 | 55.3 | 55.1 | 61.3 |
| Business Death rate per 100 active enterprises | 65.6 | 61.7 | 54.6 | 58.5 | 54.9 | 70.2 | 64.9 | 58.5 |
| Net Rate | 10.2 | 13.4 | 13.2 | 12.3 | 8.5 | -14.9 | -9.8 | 2.9 |

**Figure A3.1 Business birth rate, death rate and net rate for the West Midlands**
**Source: Created from Office of National Statistics figures (ONS, 2013).**




| | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 |
|---|---|---|---|---|---|---|---|---|
| Business Birth rate per 100 active enterprises | 13.0 | 12.4 | 11.6 | 12.1 | 11.0 | 10.1 | 9.5 | 10.6 |
| Business Death rate per 100 active enterprises | 12.3 | 11.8 | 10.2 | 10.6 | 9.6 | 12.3 | 12.0 | 9.6 |
| Net Rate | 0.8 | 0.6 | 1.4 | 1.5 | 1.4 | -2.2 | -2.4 | 1.0 |

**Figure A3.2. Business Birth, Death and Net Rates in the Black Country**
**Source: Adapted and created from Office of National Statistics figures (ONS, 2013).**

# Appendix 4: Typology of Funded Intervention Programmes

A wide range of SME intervention programmes and funding is provided by the UK government, designed to accelerate sustainable economic growth in the UK (Innovate UK, 2014a/b). Intervention programmes includes Catalyst, Catapult Centres, Collaborative R&D, Demonstrators, Feasibility Studies, IC Tomorrow, Innovation Vouchers, Knowledge Transfer Network (KTN), Launchpads, Micro and Nanotechnology Centres, Small Business Research Initiative (SBRI), Smart, Knowledge Transfer Partnership (KTP) operated by Innovate UK (formerly Technology Strategy Board), and Knowledge Exchange and Enterprise Networks (KEEN) partly funded by European Regional Development Fund (ERDF).

The two main programmes of intervention for SMEs in the West Midlands region are KTP and KEEN (Business Support Guide, 2014).

**Karl Royle - KEEN Evaluation Project Leader**

Karl Royle is the Head of Enterprise and Commercial Development in the Faculty of Education, Health and Wellbeing, University of Wolverhampton, where he works as a Research Project Director. Karl has considerable experience of project management (Certified Scrum Master) and materials development for both screen and print-based media, as well as having a background in teacher education, professional development, and education management. His current interests are around the development of thinking skills in game-based learning, and the digital skills and habits of learners using ubiquitous technology, alongside its transfer to educational contexts.

**Dr Gillian Lyons** is a Senior Lecturer in the University of Wolverhampton Business School. Her background includes business management and consultancy and her experience covers engineering, hospital management, banking and education. She has a special interest in SMEs, specifically in the marketing, enterprise and knowledge transfer areas. Gillian holds a Masters degree in Marketing Management, a professional diploma in Marketing, and a professional Doctorate in Business Administration. Her research examined the process and outcomes of knowledge transfer in SMEs, with a particular focus on strategic marketing. She has been the lead academic for a number of Knowledge Transfer Partnerships and KEEN interventions, and has provided consultancy assistance through a variety of government funded programmes. Gillian's experience in both industry and the service sector has included senior management roles in finance and general business management. She is an experienced business counsellor and consultant specialising in advising SMEs. Her research interests include university/business collaboration, together with its implication for curriculum development and CPD.

**Dr David Boucher** is a Research Associate at the University of Wolverhampton. For most of his career, David has worked within the West Midlands automotive component supply industry in the field of research and development, although recently he spent a brief spell employed in supply chain data analysis for an aerospace company. His original academic discipline was chemistry, and David obtained a PhD from the University of Birmingham for research into the catalytic polymerisation of olefins. From polymer synthesis, David moved on into material science in the field of engineering within the Lucas Group. He worked in a variety of roles for the group with responsibilities for research, manufacturing systems, quality, and design. Meanwhile the business became part of Automotive Lighting, a global supplier of vehicle lighting products. Now established in engineering, in 2005 David obtained an MSc with distinction in Advanced Technology Management in Engineering from the University of Wolverhampton. He has brought data management and a long experience in research to this project.

**Paula Simeon** is a Research Associate at the University of Wolverhampton. Paula's professional background and experience includes business management innovation and growth, operations management, marketing management, project management, financial management, audits and performance reviews, coaching and consultancy. She has considerable experience of working in private and public sector firms, as accountant, auditor, and business development executive for SMEs. Paula's interests are in the areas of business innovation, university/business collaborations, mergers and acquisitions, and foreign direct investments. She has an MBA (Master of Business Administration) with a research focus on mergers and acquisitions, as well as an MSc in Finance and Accounting, with a research focus on the efficient market hypothesis; both obtained from the University of Wolverhampton. She is a Fellow of the Chartered Management Institute.

**Dr Andrew Jones** is a Research Associate at the University of Wolverhampton. Andrew obtained his PhD from the University of Wolverhampton in 2014. The thesis investigated the motivations and consequences behind foreign direct investment entering the English Premier League. He has also worked as a Visiting Lecturer at the university and has taught in areas such as the dynamics of multinational companies and managerial economics. His research interests include football finance, football club regulation, sports ownership models, and trends in foreign direct investment flows. He also holds an MA in International Business.

**Shazad Saleem** is a Research Associate at the University of Wolverhampton. Shazad is a young, passionate interdisciplinary researcher, who has a background in sports and exercise science. He obtained an MRes in Sports Research in 2013 from the University of Wolverhampton. Shazad has worked as a teaching assistant at the university, where he also conducted research and designed an intervention in active learning in higher education. His main research interests are data analysis in sports and business performance, imagery in sports and exercise performance, emotional regulation in performance, university/business collaboration, and innovation.

**Dr Michael Stokes** is currently working as a consultant largely with clients in the post-16 sector and was formerly Senior Lecturer at the University of Wolverhampton, where his work focused on mentoring, coaching and leadership, and management in education. He was responsible for the development, management and delivery of national programmes in facilitating change and mentoring and coaching for the government Skills for Life programme. His interest in these areas is built on his long experience as a senior manager in FE. He has a PhD in Continuing Education, an MSc in Transportation and Traffic Planning, and an MSc in Environmental Resources.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